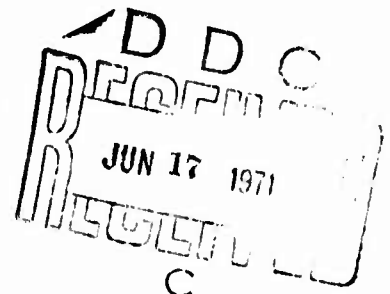


28 May 1971

Materiel Test Procedure 10-2-211
General Equipment Test Activity

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY ENGINEERING TEST PROCEDURE

PACKAGING AND CONTAINERS



AD 72553

1. OBJECTIVE

This document provides test methodology and testing techniques to determine the technical performance and safety characteristics of packaging and containers as described in Materiel Need (MN) and Technical Characteristics (TC) and to determine the items suitability for service tests.

2. BACKGROUND

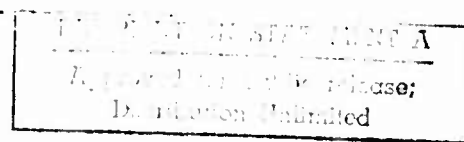
The word "packaging" is used as a synonym for "preservation and packaging". It is defined in MIL-STD-794 as the application or use of protective measures, including appropriate cleaning and drying methods, preservatives, protective wrappings, cushioning and interior containers, and complete identification marking, up to but not including the exterior pack. A container is defined as a receptacle or a flexible covering for storage and shipment of goods. The use of packaging and containers for military supplies has been developed to:

- a. Provide efficient and economical protection to supplies, materials, and equipment from environmental, physical and mechanical damage during handling, shipment, and storage from the time of original purchase until used.
- b. Assure maximum life, utility, and performance of supplies, materials, and equipment through prevention of deterioration.
- c. Facilitate efficient receipt, storage, inventory, transfer and issue.
- d. Provide identification, handling, shipment, and destination markings.
- e. Assure the greatest practicable uniformity in the development of requirements for packing and marking for shipment of the same or similar items.
- f. Effect economies by assuring the use of shipping containers of a minimum weight and cube consistent with anticipated storage and shipment hazards.

*This MTP is intended to be used as a basic guide in preparing actual test plans for the subject equipment. Specific criteria and test procedures must be determined only after careful appraisal of pertinent documentation.

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These objectives, combined with the requirement to deliver equipment and supplies to the user in a satisfactory condition wherever he might be, provide the foundation on which the current concept of military levels of packaging is based.

3. REQUIRED EQUIPMENT

In general, the following should be available for use in the accomplishment of procedures as listed by this document.

- a. Steel measuring tape.
- b. Stopwatch.
- c. Photographic equipment.
- d. Suitable scales for weighing the test item.
- e. Required material handling equipment (MHE).
- f. L.A.B. Package Testing Machine (shaker table).
- g. Portable package tester.
- h. Test equipment required by applicable tests from Fed.

Test Method STD-101.

- i. Test item and suitable test site.

4. REFERENCES

- A. Army Regulation 70-38 Research and Development: Research, Development, Test and Evaluation of Materiel for Extreme Conditions of Environment.
- B. Army Regulation 700-15 Logistics: Preservation-Packaging, Packing and Marking of Items of Supply.
- C. USATECOM Regulation 70-23 Research and Development: Equipment Performance Reports (EPRs).
- D. USATECOM Regulation 385-6 Safety: Verification of Safety of Materiel During Testing.
- E. USATECOM Regulation 700-1 Quality Assurance: Value Engineering.
- F. USATECOM Regulation 750-15 Maintenance of Supplies and Equipment: Maintenance Evaluation During Testing.
- G. USAGETA Document Human Factors Evaluation Data for General Equipment (HEDGE).
- H. Federal Test Method STD-101 Preservation, Packaging and Packing Materials: Test Procedures.
- I. MIL-STD-794 Parts and Equipment, Procedures for Packaging and Packing of.
- J. MTP 9-2-503 Durability.
- K. MTP 10-2-500 Physical Characteristics.
- L. MTP 10-2-501 Operator Training and Familiarization.
- M. MTP 10-2-503 Surface Transportability (General Supplies and Equipment).
- N. MTP 10-2-505 Human Factors Evaluation.

- O. MTP 10-2-507 Maintenance Evaluation.
- P. MTP 10-2-508 Safety.
- Q. MTP 10-2-511 Quality Assurance
- R. MTP 10-2-512 Reliability.

5. SCOPE

5.1 SUMMARY

The purpose for testing is to determine that the test item can be easily and effectively utilized by service personnel without hazard to person or equipment. This procedure describes the preparation for, and methods of, evaluating the technical performance and safety characteristics of packaging and containers. To assess the degree of conformance with required standards and established criteria, the test item should be subjected to the following:

a. Preparation for Test - A pretest inspection to determine the condition of the test item and its associated package, upon arrival at the test site. A determination of the test item physical characteristics, an operator training and familiarization program, and an operational check and functional verification.

b. Operation and Performance - A series of tests selected, as applicable, from Federal Test Method Standard 101 to determine the performance and physical characteristics of the test item to provide protection for the packaged equipment during shipping, handling, and storage hazards expected to be encountered.

c. Durability - An evaluation of the test item ability to retain original physical and performance characteristics after periods of extended use.

d. Transportability - An evaluation to determine the ability of the test item to withstand the forces which it will experience during normal handling and transporting.

e. Maintenance and Reliability Evaluation - An evaluation to determine and appraise the maintenance characteristics and requirements of the test item, a verification and appraisal of its reliability, and an evaluation of the associated publications.

f. Safety - An evaluation to determine the safety characteristics and possible hazards of the test item.

g. Human Factors - An evaluation to determine the adequacy of the design and performance characteristics of the test item and associated equipment in terms of conformance to accepted human factors engineering design criteria.

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h. Value Analysis - An evaluation directed at analyzing the primary function and features of the test item for the purpose of cost reduction without compromising performance, reliability, quality, maintainability or safety.

i. Quality Assurance - A review to determine and evaluate defects in material and workmanship.

5.2 LIMITATIONS

This MTP is limited to procedures for testing packaging and containers used for general equipment.

6. PROCEDURES

5.1 PREPARATION FOR TEST

NOTE: Prepare an Equipment Performance Report in accordance with applicable procedures in USATECOM Regulation 70-23 for any items that are missing, damaged or considered inadequate when completing the following procedures:

6.1.1 Initial Inspection

Upon receipt of the test item at the test site, perform the following:

a. Visually inspect the test item for any evidence of damage incurred during transport. Photograph and record as required.

b. Visually inspect for any deviation from MIL-STD-129 Marking for Shipment and Storage.

c. Record any observed defect or condition which is considered to be a potential hazard to the safety of test personnel or facilities.

6.1.2 Inventory Check

Conduct an inventory of the number of packages received against the shipping document. Submit an Equipment Performance Report for each noted shortage or discrepancy in accordance with applicable procedures in USATECOM Regulation 70-23.

6.1.3 Physical Characteristics

Determine the weight and overall dimensions of the test item in accordance with procedures of MTP 10-2-500.

6.1.4 Operator Training and Familiarization

Members of the test team shall be oriented in accordance with the provisions of MTP 10-2-501.

a. Record the rank, MOS, past experience, and extent of additional training required for each test team member.

b. Test personnel shall receive a review of all safety precautions and hazards associated with the appropriate test facilities and the test item. This review shall include, but not be limited to the following:

- 1) General test facility hazards and safety precautions.
- 2) Fire hazard, fighting, and prevention.
- 3) Hazards and precautions associated with manual lifting.

c. Test personnel shall be instructed in the capabilities, operational characteristics, and limitations, in accordance with guidance contained in the draft technical manuals and other instructional material. Training, instruction, and familiarization shall include but not be limited to the following:

- 1) Applicable terminology.
- 2) Operation and use of test facilities.
- 3) The team members shall be furnished information concerning the test item as follows:
 - a) Physical characteristics and description.
 - b) Limitations.
 - c) Maintenance and service requirements.
 - d) Other information as appropriate.
- 4) Test team members shall receive instructions pertaining to test objectives.
- 5) Record the adequacy and completeness of the draft technical manual(s) and/or other instructional material.

6.2 TEST CONDUCT

The testing program shall be arranged so as to determine by controlled, measured, documented testing, the technical performance and safety characteristics of the test item.

NOTES: 1. All equipment malfunctions occurring during the testing procedures shall be reported in accordance with USATECOM Regulation 70-23.

2. Prior to initiating test procedures, the test officer will review and implement all safety considerations contained in section 6.2.3.

6.2.1 Operation and Performance

Packaging and containers for any specific equipment are determined by the extent of protection required to meet the shipping, handling, and storage hazards expected to be encountered. The three levels of protection A, B, and C established to meet requirements for military packing are published in MIL-STD-794. Standard engineering tests established for the evaluation of packaging and containers are embodied in Federal Test Method Standard 101. Operational engineering tests to evaluate the performance and physical characteristics of packaging and containers shall be selected from the applicable sections of Federal Test Method Standard 101 predicated upon the level of pack for which the packaging and container is intended and the test requirements of MN or other pertinent documents.

- a. Determine the requirements of the stated protection level.
- b. Select engineering tests from Federal Test Method Standard 101 to evaluate the requirements of the stated protection level of the MN or other pertinent document.
- c. Perform the selected tests to determine if the test item conforms to or is an improvement on the stated requirements.

6.2.2 Durability

The test item durability shall be verified by performing the applicable procedures of MTP 9-2-503 and the following:

- a. During accomplishment of testing as described by this document, the durability characteristics of the test item shall be observed.
- b. Upon completion of all testing as described in this document, the test item shall be inspected for signs of excessive or accelerated wear and potential failure.
- c. Record appropriate data as required by MTP 9-2-503 and any indication of the following:
 - 1) Fastening failure.
 - 2) Loose or missing hardware.
 - 3) Excessive wear.
 - 4) Warping and/or distortion.
 - 5) Damage to material or finish.

6.2.3 Transportability

Evaluate the transportability characteristics of the test item.

NOTE: Personnel should be familiar with the applicable portions of MIL-STD-794 and documents referenced therein.

a. The draft technical manual shall be reviewed or consulted for proper procedures for tying down, and lifting, and transporting the test item by various media. Any inadequacy of instructions should be reported by EPR.

b. Evaluate the transportability characteristics of the test item by accomplishing the applicable procedures of MTP 10-2-503. Record the appropriate data.

6.2.4 Maintenance and Reliability Evaluation

a. Evaluate and appraise the maintenance/reliability related factors of the test item as described in the applicable sections of MTP 10-2-507, MTP 10-2-512 and AMC Pamphlet 706-134.

b. Evaluate the draft technical manuals for completeness, accuracy, simplicity, clarity, propriety and organization.

6.2.5 Safety

Evaluate the safety characteristics and features of the test item in accordance with the applicable procedures in MTP 10-2-508.

- NOTES:
1. Provide a safety recommendation in accordance with USATECOM Regulation 385-6, and the test directive, as applicable.
 2. During the conduct of all tests, test personnel shall observe the proper safety precautions and, in particular, shall adhere closely to the draft technical manual for the handling and use of the test item.
 3. The procedures for all tests shall be examined and any condition which might constitute a safety hazard shall be recorded and also reported to the testing officer.

Perform the following:

- a. Examine the safety characteristics of the test item and its design to ensure that maximum safety has been provided consistent with military requirements. Hazards shall be classified as safe, marginal, critical, and catastrophic.
- b. Prepare a list of all test item safety features and/or devices; indicate the type of feature, its purpose, and the suitability and adequacy of the feature.
- c. Test personnel shall record any worthwhile comments or suggestions relating to improvement or safety features, safety measures, and/or precautions.
- d. The safety statement will be reviewed and evaluated by the project officer who will assure that test personnel are aware of the limitations of the test item before conduct of engineering test.

6.2.6 Human Factors Evaluation

Accomplish the applicable procedures of MTP 10-2-505 and the following:

- a. Evaluate the test item to determine the degree to which its physical design and revealed performance characteristics conform to recognized human factors engineering design criteria.
- b. Prepare checklists for all associated tasks to include:
 - 1) Communications quality of instructions as indicated by ease of understanding of draft technical manuals.
 - 2) System design to the extent of personnel compatibility with manhandling such as, loading and unloading.
 - 3) Minimum and optimum number of personnel and the skill level(s) required.
 - 4) Time(s) required.

6.2.7 Value Analysis

- a. During the conduct of all tests, test personnel shall evaluate the test item from a value versus cost standpoint. Record all pertinent comments concerning features or components which can be eliminated or modified to accomplish cost reduction without impairment of performance, reliability, quality, maintainability, or safety. The applicable portions of USATECOM Regulation 700-1 shall be used for this evaluation.
- b. Consideration shall be given to the topics listed below. Record appropriate comments for each topic.

- 1) Mission Capacity
- 2) Simplicity
- 3) State of the Art
- 4) Standardization

6.2.8 Quality Assurance

Throughout all tests, examine the test item for compliance with the quality requirements of the applicable MN and the provisions of MTP 10-2-511.

6.3 TEST DATA

NOTE: In compiling the Test Data section, test personnel should expound upon those data procedures which are other than quantitative in nature by recording narrative descriptions which will provide full details of conditions and/or events occurring during the conduct of the test.

6.3.1 Preparation for Test

6.3.1.1 Initial Inspection

Record the following:

- a. Manufacturer, model, and other appropriate data.
- b. Method of transport used to deliver the test item.
- c. Any damage to the test item.
- d. Any damage or deterioration resulting from handling, improper packaging, and/or inadequate preservation.
- e. Any noncompliance with the standards for shipping, marking, preservation and packaging.
- f. Any indication of defects in the following areas (describe in detail):
 - 1) Workmanship.
 - 2) Construction.
 - 3) Materials.
- g. Any condition considered to be a potential hazard to the safety of test personnel or facilities.

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6.3.1.2 Inventory

document. List any packages missing that are shown on shipping

6.3.1.3 Physical Characteristics

Record the data required by MTP 10-2-500 and as follows:

- a. Manufacturer and model, type/class.
- b. Safety equipment supplied.
- c. Weight and overall dimensions of the test item (in pounds and inches).
- d. Other data as appropriate.

6.3.1.4 Operator Training and Familiarization

Record the data required by MTP 10-2-501 and the following:

- a. Methods used and completion of test personnel training and evaluation of technical manuals.
- b. Evidence that test personnel are sufficiently knowledgeable in objectives and procedures.
- c. The personal data required for selected personnel.

6.3.2 Test Conduct

6.3.2.1 Operation and Performance

Record the following:

- a. Stated level of protection.
- b. Engineering tests selected from Federal Test Method Standard 101.
- c. Test equipment used.
- d. Results of testing.

6.3.2.2 Durability

Record appropriate data as required by MTP 9-2-503 and any indication of the following:

- a. Fastening failure.
- b. Loose or missing hardware.
- c. Excessive wear.
- d. Warping and/or distortion.
- e. Damage to material or finish.

6.3.2.3 Transportability

Record appropriate data as required by MTP 10-2-503 and as follows:

- a. Item under test (indicate manufacturer, model, etc.).
- b. Type of container and packaging.
- c. Dimensions of container.
- d. Weight of the complete package.
- e. MHE used.
- f. Number of personnel required (indicate rank and MOS).
- g. Method of transport utilized.
- h. Any damage to the test item.
- i. Any evidence of shifting of contents, loosening or breaking of holddowns, ties, stays, blocking, or bracing.
- j. Adequacy of tiedown/securing devices and lifting attachments.

6.3.2.4 Maintenance and Reliability

Record appropriate data as required by the applicable portions of MTP 10-2-507, MTP 10-2-512 and the following:

- a. Maintenance literature which is not easily understood, incomplete or ineffective.
- b. All applicable data to permit the computations as required by Appendix A, USATECOM Regulation 750-15.

6.3.2.5 Safety

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Record appropriate data as required by MTP 10-2-508 and as follows:

a. Prepare a list of all test item safety features; indicate the following:

- 1) Type of feature/device.
- 2) Purpose of the feature/device.
- 3) Suitability of the feature/device.
- 4) Adequacy of the feature/device.
- 5) Proper operation of the feature/device.

b. Prepare a list of all warning plates, instructions, and markings. Record the location and adequacy of each item listed.

c. Any condition that might present a safety hazard including the cause of the hazard, and the steps taken to alleviate the condition.

d. Any suggestions relative to improvement of safety features, safety measures and/or precautions.

e. Provide a safety recommendation in accordance with USATECOM Regulation 385-6.

6.3.2.6 Human Factors Evaluation

Record the data required by MTP 10-2-505.

Prepare checklists for each of the various tasks associated with each test function. Rate each task as satisfactory or unsatisfactory from a human factors standpoint. In rating the task include the specific considerations peculiar to the task and the following general considerations:

- a. Adequacy of instructions to perform the task.
- b. Mental and physical effort required.
- c. Design of the test item as it affects the task.
- d. Time required to perform the task.
- e. Personnel required to perform the task.

6.3.2.7 Value Analysis

a. Record appropriate comments for each of the topics listed below:

- 1) Mission Capacity
- 2) Simplicity
- 3) State of the Art

- 4) Standardization
- 5) Materials and Methods of Construction
- 6) Clearances

b. When making recommendations for changes in test item features, record the following:

- 1) The feature under consideration.
- 2) Recommended change(s).
- 3) Reason(s) for recommended change(s).

6.3.2.8 Quality Assurance

Record:

- a. Data required by MTP 10-2-511
- b. Comments as to any design shortcomings in the area of required quality.

6.4 DATA REDUCTION AND PRESENTATION

a. Data obtained during the conduct of the test will be summarized making use of photographs and charts as appropriate. All photographs and charts will be properly identified and labeled. Test data will be obtained for each packaging and container tested, and summarized and evaluated as required.

b. Data obtained for each performance characteristic will be compared with established technical performance characteristics as specified in MN or other developmental criteria. Test data obtained from different types of packaging and containers undergoing the same test will be compared. Where performance is repeated after a specific test, the data obtained will be compared with the previously obtained data, and where definite differences occur, the conditions that caused the differences and the degree of difference will be summarized along with the appropriate comments of the test personnel.

c. In addition to charts and photographs, the presentation shall include narrative reports of all phases of the test.

d. The presentation shall conclude with a summarization of the suitability of the test item for service testing.

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14. KEY WORDS

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